CLAIMS

What is claimed:

1. An ambient atmosphere ion thruster system, comprising at least one ambient atmosphere ion thruster,

the at least one ambient atmosphere ion thruster comprising at least one pair of permeable electrical members, the at least one pair of permeable electrical members comprising a forward permeable electrical member and an aft permeable electrical member, and the forward permeable electrical member and the aft permeable electrical member, each having an opposing polarity in relation to one another, for accelerating a plurality of intercepted ambient atmosphere ions,

the at least one ambient atmosphere ion thruster being mounted to a craft, and

at least one reaction force being imparted to the craft by accelerating the plurality of intercepted ambient atmosphere ions.

2. A system, as recited in Claim 1, further comprising at least one insulating support structure for mechanically connecting the at least one ambient atmosphere ion thruster to the craft, the at least one insulating support structure having at least one electrical feed for electrically connecting the at least one pair of permeable electrical members to an electrical power source.

3. A system, as recited in Claim 1,

wherein each member of the at least one pair of permeable electrical members is mechanically connected to one another,

wherein a plurality of ambient atmosphere constituents, being intercepted by the at least one pair of permeable electrical members, comprises an intake mass flux, and

wherein a plurality of accelerated ambient atmosphere ions, imparting the reaction force to the craft, comprises an exhaust mass flux.

4. A system, as recited in Claim 1, wherein two ambient atmosphere ion thrusters are fixedly mounted to opposing sides of the craft to each orient an electric field for cooperatively boosting, deboosting, and attitude-controlling the craft along a single axis.

5. A system, as recited in Claim 1, wherein four ambient atmosphere ion thrusters are fixedly mounted to opposing vertices of the craft to each orient an electric field for cooperatively boosting, deboosting, and attitude-controlling the craft along two axes.

6. A system, as recited in Claim 1, wherein two ambient atmosphere ion thrusters are rotatably mounted to opposing sides of the craft to each orient an electric field for cooperatively boosting, deboosting, and attitude-controlling the craft along two axes as well as for laterally thrusting the craft.

7. A system, as recited in Claim 1, wherein four ambient atmosphere ion thrusters are rotatably mounted to a set of locations selected from a group consisting essentially of generally opposing vertices of the craft and generally opposing surfaces of the craft to each orient an electric field for cooperatively boosting, deboosting, and attitude-controlling the craft along three axes as well as for laterally thrusting the craft.

8. A system, as recited in Claim 1, wherein a single annular ambient atmosphere ion thruster is fixedly mounted to the craft to orient an electric field for boosting and deboosting the craft.

9. A system, as recited in Claim 1,

wherein four ambient atmosphere ion thrusters are fixedly mounted to a set of locations selected from a group consisting essentially of generally opposing vertices of the craft and generally opposing surfaces of the craft, and

wherein one opposing pair of the four thrusters is fixedly mounted to the craft in a plane perpendicular to that of the remaining opposing pair of thrusters to each orient an electric field for cooperatively boosting, deboosting, and attitude-controlling the craft along two axes as well as for laterally thrusting the craft.

10. A system, as recited in Claim 1, further comprising at least one means for reversing the polarity of the at least one pair of permeable electrical members for reversing thrust.

11. A system, as recited in Claim 1, wherein the at least one ambient atmosphere ion thruster is operable in a path selected from a group consisting essentially of an orbit proximal to any celestial body having a sensible atmosphere and in a free trajectory.

12. A system, as recited in Claim 1, further comprising at least one auxiliary ionizing device selected from a group consisting essentially of an electron bombardment ionizer, a radio frequency ionizer, a microwave ionizer, an extreme ultraviolet ionizer, a flash lamp ionizer, and a magnetic field ionizer for ionizing any un-ionized constituents in the ambient atmosphere.

13. A system, as recited in Claim 1, further comprising at least one electromagnetic field modifying device selected from a group consisting essentially of a permanent magnet and an electromagnetic field projector for modifying the electromagnetic field of the plurality of ambient atmosphere ions.

14. A system, as recited in Claim 12, further comprising at least one electromagnetic field modifying device selected from a group consisting essentially of a permanent magnet and an electromagnetic field projector for modifying the electromagnetic field of the plurality of ambient atmosphere ions.

15. A system, as recited in Claim 1, wherein the at least one pair of permeable electrical members comprises at least one electrical component selected from a group consisting essentially of at least one pair of electrical grids and at least one pair of porous electromagnetic structures.

16. A system, as recited in Claim 1, wherein the at least one ambient atmosphere ion thruster operates in a low Earth orbit in a range of approximately 200 km to approximately 1000 km.

17. A system, as recited in Claim 1, wherein the at least one ambient atmosphere ion thruster operates in a low Earth orbit in a range of approximately 300 km to approximately 1000 km.

18. A system, as recited in Claim 1, further comprising an electron gun for neutralizing any net operational charge buildup on the craft due to operation of the at least one thruster.

19. A system, as recited in Claim 12, further comprising an electron gun for neutralizing any net operational charge buildup on the craft due to operation of the at least one thruster.

20. A system, as recited in Claim 1, wherein the at least one thruster is mounted to the craft in a disposition selected from a group consisting essentially of outboard and inboard.

21. An ambient atmosphere ion thruster method, comprising providing at least one ambient atmosphere ion thruster,

the at least one ambient atmosphere ion thruster providing step comprising providing at least one pair of permeable electrical members, the at least one pair of permeable electrical members providing step comprising providing a forward permeable electrical member and providing an aft permeable electrical member, and the forward permeable electrical member providing step and the aft permeable electrical member providing step together comprising providing each member, having an opposing polarity in relation to one another, for accelerating a plurality of intercepted ambient atmosphere ions,

the at least one ambient atmosphere ion thruster being mounted to a craft, and

at least one reaction force being imparted to the craft by accelerating the plurality of intercepted ambient atmosphere ions.

22. A method, as recited in Claim 21, further comprising the step of providing at least one insulating support structure for mechanically connecting the at least one ambient atmosphere ion thruster to the craft, the at least one insulating support structure having at least one electrical feed for electrically connecting the at least one pair of permeable electrical members to an electrical power source.

23. A method, as recited in Claim 21,

wherein the step of providing the at least one pair of permeable electrical members comprises mechanically connecting each member of the at least one pair to one another,

wherein the step of providing the at least one pair of permeable electrical members comprises providing a plurality of ambient atmosphere constituents, being intercepted by the at least one pair of permeable electrical members, comprising an intake mass flux, and

wherein the step of providing the at least one pair of permeable electrical members comprises providing a plurality of accelerated ambient atmosphere ions, imparting the reaction force to the craft, comprising an exhaust mass flux.

24. A method, as recited in Claim 21, wherein the step of providing the at least one ambient atmosphere ion thruster comprises providing two ambient atmosphere ion thrusters being fixedly mounted to opposing sides of the craft to each orient an electric field for cooperatively boosting, deboosting, and attitude-controlling the craft along a single axis.

25. A method, as recited in Claim 21, wherein the step of providing the at least one ambient atmosphere ion thruster comprises providing four ambient atmosphere ion thrusters being fixedly mounted to opposing vertices of the craft to each orient an electric field for cooperatively boosting, deboosting, and attitude-controlling the craft along two axes.

26. A method, as recited in Claim 21, wherein the step of providing the at least one ambient atmosphere ion thruster comprises providing two ambient atmosphere ion thrusters being rotatably mounted to opposing sides of the craft to each orient an electric field for cooperatively boosting, deboosting, and attitude-controlling the craft along two axes as well as for laterally thrusting the craft.

27. A method, as recited in Claim 21, wherein the step of providing the at least one ambient atmosphere ion thruster comprises providing four ambient atmosphere ion thrusters being rotatably mounted to a set of locations selected from a group consisting essentially of generally opposing vertices of the craft and generally opposing surfaces of the to each orient an electric field for cooperatively boosting, deboosting, and attitude-controlling the craft along three axes as well as for laterally thrusting the craft.

28. A method, as recited in Claim 21, wherein the step of providing the at least one ambient atmosphere ion thruster comprises providing a single annular ambient atmosphere ion thruster being fixedly mounted to the craft to orient an electric field for boosting and deboosting.

29. A method, as recited in Claim 21,

wherein the step of providing the at least one ambient atmosphere ion thruster comprises providing four ambient atmosphere ion thrusters being fixedly mounted to a set of locations selected from a group consisting essentially of generally opposing vertices of the craft and generally opposing surfaces of the craft, and

wherein the step of providing the at least one ambient atmosphere ion thruster comprises providing one opposing pair of the four thrusters being fixedly mounted to the craft in a plane perpendicular to that of the remaining opposing pair of thrusters to each orient an electric field for cooperatively boosting, deboosting, and attitude-controlling the craft along two axes as well as for laterally thrusting the craft.

30. A method, as recited in Claim 21, further comprising the step of providing at least one means for reversing the polarity of the at least one pair of permeable electrical members for reversing thrust.

31. A method, as recited in Claim 21, wherein the at least one ambient atmosphere ion thruster providing step comprises operating the at least one ambient atmosphere ion thruster in a path selected from a group consisting essentially of an orbit proximal to any celestial body having a sensible atmosphere and in a free trajectory.

32. A method, as recited in Claim 21, further comprising the step of providing at least one auxiliary ionizing device selected from a group consisting essentially of an electron bombardment ionizer, a radio frequency ionizer, a microwave ionizer, an extreme ultraviolet ionizer, a flash lamp ionizer, and a magnetic field ionizer for ionizing any un-ionized constituents in the ambient atmosphere.

33. A method, as recited in Claim 21, further comprising the step of providing at least one electromagnetic field modifying device selected from a group consisting essentially of a permanent magnet and an electromagnetic field projector for modifying the electromagnetic field of the plurality of ambient atmosphere ions.

34. A method, as recited in Claim 32, further comprising the step of providing at least one electromagnetic field modifying device selected from a group consisting essentially of a permanent magnet and an electromagnetic field projector for modifying the electromagnetic field of the plurality of ambient atmosphere ions.

35. A method, as recited in Claim 21, wherein the step of providing the at least one pair of permeable electrical members comprises providing at least one electrical component selected from a group consisting essentially of at least one pair of electrical grids and at least one pair of porous electromagnetic structures.

36. A method, as recited in Claim 21, wherein the at least one ambient atmosphere ion thruster providing step comprises operating the at least one ambient atmosphere ion thruster in a low Earth orbit in a range of approximately 200 km to approximately 1000 km.

37. A method, as recited in Claim 21, wherein the at least one ambient atmosphere ion thruster providing step comprises operating the at least one ambient atmosphere ion thruster in a low Earth orbit in a range of approximately 300 km to approximately 1000 km.

38. A method, as recited in Claim 21, further comprising the step of providing an electron gun for neutralizing any net operational charge buildup in the at least one thruster.

39. A method, as recited in Claim 32, further comprising the step of providing an electron gun for neutralizing any net operational charge buildup in the at least one thruster.

40. A method, as recited in Claim 21, wherein the at least one thruster providing step comprises mounting the at least one thruster to the craft in a disposition selected from a group consisting essentially of outboard and inboard.